

# Cyclotron Plasma Actuator with Arc-Magnet for Active Flow Control, Phase II

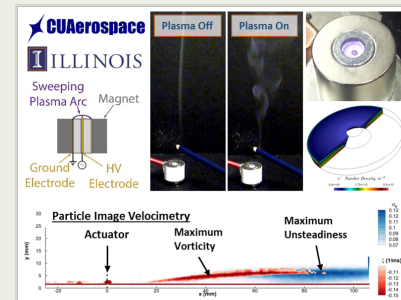
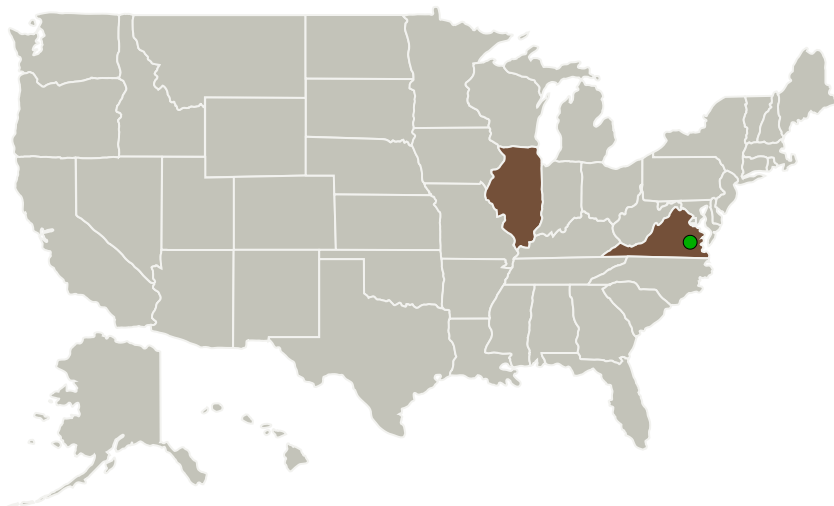
Completed Technology Project (2017 - 2019)



## Project Introduction

CU Aerospace and team partner the University of Illinois at Urbana-Champaign propose to develop a new type of plasma-based flow control actuator, which uses a high-voltage electrode that arcs to a cylindrical grounded electrode within a magnetic field. The result is that an arc plasma can be produced, with a Lorentz force that creates a plasma disc (similar concept to a cyclotron). The thought behind this concept is that the thermal actuator authority provided by the plasma arc is coupled with an induced swirl component into a boundary-layer flow, which will enhance mixing and allow flows to remain attached across strong adverse pressure gradients. Effectively, the proposed actuator would function like vortex generators that one can actively enable or disable on command. This subsystem demonstration will pioneer a family of devices to address a notoriously difficult problem in active flow control. The new capabilities in aerodynamic performance enabled by this innovative actuation approach will be demonstrated in both ground and flight tests. CU Aerospace will design, fabricate, and deliver a flight-ready demonstration plasma actuator to NASA at the end of the Phase II program.

## Primary U.S. Work Locations and Key Partners



Cyclotron Plasma Actuator with Arc-Magnet for Active Flow Control, Phase II Briefing Chart Image

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
CU Aerospace, LLC	Lead Organization	Industry	Champaign, Illinois
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

## Primary U.S. Work Locations

Illinois	Virginia
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## Project Transitions

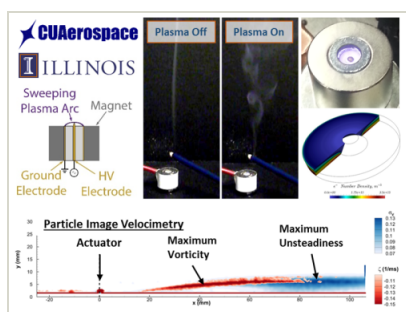
▶ **April 2017:** Project Start

✓ **October 2019:** Closed out

## Closeout Documentation:

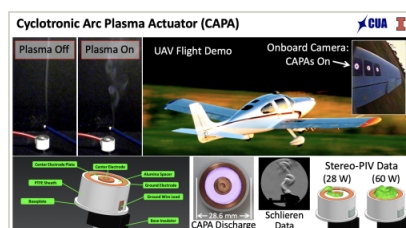
- Final Summary Chart(<https://techport.nasa.gov/file/140909>)

## Images



## Briefing Chart Image

Cyclotron Plasma Actuator with Arc-Magnet for Active Flow Control, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/130639>)



## Final Summary Chart Image

Cyclotron Plasma Actuator with Arc-Magnet for Active Flow Control, Phase II (<https://techport.nasa.gov/image/128196>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

CU Aerospace, LLC

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

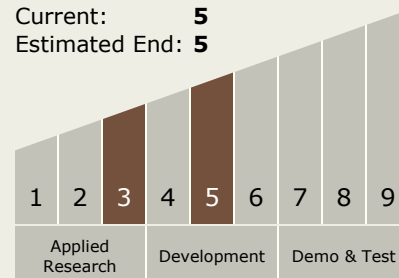
Carlos Torrez

## Principal Investigator:

David L Carroll

## Technology Maturity (TRL)

Start: 3  
Current: 5  
Estimated End: 5



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## Technology Areas

### Primary:

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.5 Propulsion Flowpath and Interactions

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System